MULTIMEDIA UNIVERSITY

STUDENT IDENTIFICATION NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2018/2019

BDS 4614 – MANAGEMENT DECISION SCIENCE

(All sections / Groups)

17 OCTOBER 2018
9.00 a.m. - 12.00 p.m.
(3 Hours)

INSTRUCTIONS TO STUDENTS

1. This Question paper consists of **FIVE (5)** pages with **FIVE (5)** questions only.

2. Answer **ALL** the questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please write all your answers in the Answer Booklet provided.

QUESTION 1 [20 marks]

The Luxury produces two sizes of trolley bags – regular and large. The trolley bags are produced in 10,000 lots. The trolley bags are processed through a sewing operation and an assembling operation. The company has 30 days available for both sewing and assembling. A lot of regular-size trolley bag requires 2 days to sew and 4 days to assemble, whereas a lot of large trolley bag requires 4 days to sew and 2 days to assemble. A lot of regular-size trolley bag earns $800, and a lot of large-size trolley bag earns $900 profit. In order to fulfil its obligations under a shipping contract, the company could produce at most nine lots. The company wants to determine the number of lots to produce regular and large size trolley bags (X1 and X2 respectively) in order to maximize profit.

a) Formulate the above problem as a linear programming model. **[5 marks]**

b) Set up an initial simplex table for the above linear programming model. **[5 marks]**

Answer the following questions based on the final simplex tableau given below:

Cj →		800	900	0	0	0	
↓	SOLUTION MIX	X1	X2	S1	S2	S3	QTY
900	X2	0	1	0.5	0	-1	6
0	S2	0	0	1	1	-6	6
800	X1	1	0	-0.5	0	2	3
	Zj	800	900	50	0	700	7800
	Cj - Zj	0	0	-50	0	-700	

where X1 = Output of regular trolley bags; X2 = Output of large trolley bags
S1 = Slack for sewing; S2 = Slack for assembling; S3 = lots

c) State the optimum output mix and the associated maximum profit. **[4 marks]**

d) Assuming that there are three resources at this stage, what are the resources that are fully utilized and which resource is still not fully utilized? **[3 marks]**

e) If the premium required for one additional sewing operation is RM60 per day, is it worth acquiring additional units of this resource? Explain your answer. **[3 marks]**

Continued...

QUESTION 2 [20 marks]

a) TBH Construction has plants in three locations and it is currently working on three major construction projects, each located at a different site. The shipping cost per truckload of concrete, daily plant capacities, and daily project requirements are provided in the table below:

From	To			Plant Capacities
	Project A	Project B	Project C	
Plant 1	$20	$8	$22	140
Plant 2	$24	$10	$16	100
Plant 3	$18	$14	$12	60
Project Requirements	80	100	120	300

Formulate an initial feasible solution to the transportation problem, by using the Northwest Corner Method. Then evaluate each unused shipping route by computing all improvement indices using Stepping Stone Method.

[10 marks]

b) Alan is the manager of I-furniture. I-furniture allows its customer to design and customize their furniture. In October 2018, I-furniture receives three urgent orders which have to be completed as soon as possible. Currently there are four production teams available to handle the orders, the time (in hours) required for each team to complete the orders are shown in the following table. Determine the optimal assignment plan. What is the minimum time to complete all orders?

	Team			
Order	1	2	3	4
A	8	11	12	10
B	5	16	13	8
C	5	10	23	15

[10 marks]

Continued...

QUESTION 3 [20 marks]

Tim is developing a production plan for a large machine. The production of the large machine involves a number of activities. The activities, immediate predecessors, and time are presented in the following table:

Activity	Time (Hours)			Immediate Predecessors
	a	*m*	*b*	
A	6	4	2	-
B	2	3	4	A
C	1	2	3	A,B
D	3	7	5	B
E	2	4	6	C, D
F	6	12	14	E
G	1	2	4	F
H	3	6	6	E, F
I	10	11	12	G, H

a) Construct a network diagram for this problem.

[6 marks]

b) Determine the expected time, variance, ES, EF, LS, LF and slack for each activity.

[10 marks]

c) Determine the critical path to produce the large machine.

[2 marks]

d) Calculate the variance and the expected completion time of the large machine.

[2 marks]

Continued...

QUESTION 4 [20 marks]

Home Realty, a real estate development firm, is considering several alternative development projects. These include building and leasing an office park, purchasing a parcel of land and building an office building to rent, buying and leasing a warehouse, building a mall and building and selling condominiums. The various development projects and their 5-year financial return (in $1,000,000s) given that interest rates will decline, remain stable or increase, are shown in the following payoff table:

Alternative	Interest Rate		
	Decline (RM)	Stable (RM)	Increase (RM)
Office park	0.5	1.7	4.5
Office building	1.5	1.9	2.5
Warehouse	1.7	1.4	1.0
Mall	0.7	2.4	3.6
Condominium	3.2	1.5	0.6

a) Determine the best investment, using the following decision criteria:

(i) Maximax **[2 marks]**
(ii) Maximin **[2 marks]**
(iii) Equal Likelihood **[4 marks]**
(iv) Hurwicz criterion of realism ($\alpha = 0.3$) **[4 marks]**

b) An economist is hired to assign a probability to each direction interest rates may take over the next five years. The economist has determined that there is a 0.5 probability that interest rate will decline, 0.4 probability that rates will remain stable, and a 0.1 probability that rates will increase. Using expected value, determine the best project. **[4 marks]**

c) Determine the expected value of perfect information. **[4 marks]**

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QUESTION 5 [20 marks]

A company purchases a component used in the assembly of smoke detectors directly from the supplier. The price of each component is RM8. The supplier will deliver order of any size for a charge of RM4. The cost of holding an item in inventory for a year is estimated to be 20% of the cost price. The store manager estimates that 500 components are required monthly. It takes approximately 10 days for an order to arrive once the order has been placed. Currently, the computer store has a policy of ordering 250 units for two times in a month.

a) What is the annual demand? **[2 marks]**

b) Calculate the total inventory cost based on the **current** ordering policy. **[6 marks]**

c) Compute the **optimum order quantity** and calculate the associated minimum total inventory cost. **[10 marks]**

d) Based on the optimum order quantity, should the store change its ordering policy. **[2 marks]**

End of paper.